



MARSHALL STAR

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Sept. 17, 2009

Marshall's Ares team, ATK successfully test Ares I first-stage motor

By Craig Dunn

The Marshall Space Flight Center and industry engineers lit up the Utah sky Sept. 10 with the initial full-scale, full-duration test firing of the first-stage motor for the Ares I rocket.

ATK Space Systems conducted the successful stationary firing of the five-segment solid development motor 1, or DM-1. ATK Space Systems, a division of Alliant Techsystems of Brigham City, Utah, is the prime contractor for the Ares I first stage.

Engineers will use the measurements gathered from the test to evaluate thrust, roll control, acoustics and motor vibrations.

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The Ares I rocket's first-stage development motor, or DM-1, completed its first successful test firing Sept. 10. During the 122-second test firing, the flame exited the motor at Mach 3.

STS-128 mission upgrades space station's research capabilities



STS-128 mission crew members gather behind space shuttle Discovery after landing Sept. 11 in California. From left are astronauts Jose Hernandez, Kevin Ford, Christer Fuglesang, Rick Sturckow, Danny Olivas and Patrick Forrester.

By Sanda Martel

"A beautiful ending to a great mission," said Steve Cash, manager of the Shuttle Propulsion Office at the Marshall Space Flight Center, speaking of space shuttle Discovery's launch, mission and landing.

From launch at Kennedy Space Center, Fla., Aug. 28, to landing at Edwards Air Force Base, Calif., on Sept. 11, the 14-day mission helped bring the International Space Station "one step closer to being a robust orbiting laboratory," said Jimmie Johnson, Marshall project manager of the Material Science Research Rack.

The Material Science Research Rack

See Landing on page 2

The results are in...

8 years of ISS science research accomplishments published

By Lori Meggs

Advances in the fight against food poisoning, new methods for delivering medicine to cancer cells, and better materials for future spacecraft are among the results just published in a NASA report detailing scientific research accomplishments made aboard the International Space Station during its first eight years.

The results include more than 100 science experiments, ranging from bone studies to materials research.

The first 15 expeditions aboard the space station, from 2000 to 2008, have established the orbiting laboratory as a unique opportunity for research. The accomplishments are unique because they came as the space station was still being assembled.

The report concisely compiles all experiment results collected from each expedition. Some of the summarized investigations are complete with results

released, others include preliminary results and some remain ongoing projects.

"This report represents a record of science accomplishments during space station assembly, and summarizes peer-reviewed publications to date," said Julie Robinson, program scientist for the International Space Station at the Johnson Space Center in Houston. "As we enter the final year of assembly, this report highlights the capabilities and opportunities for station research after assembly is complete."

NASA's research activities on the space station are planned and coordinated by the Payload Operations Center at the Marshall Space Flight Center. These activities span several scientific areas, including exploration technology development; microgravity research in the physical and biological sciences; human physiology research;

Earth science; and education.

The report details 22 different technology demonstrations, 33 physical science experiments, 27 biological experiments, 32 experiments focused on the human body, Earth observations and educational activities. In addition to science important to long-duration human spaceflights, most findings also offer new understanding of methods or applications relevant to life on Earth.

The International Space Station Program Scientist Office at the Johnson Center published the report. A link to the full NASA Technical Publication, which provides an archival record of U.S.-sponsored research through Expedition 15, is available at http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20090029998_2009030907.pdf

Meggs, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

Landing *Continued from page 1*

is one of two refrigerator-sized science racks delivered to the orbiting outpost. It will be used to conduct experiments in the microgravity environment on materials such as metals, glasses and ceramics, which could lead to the development of better materials on Earth.

The other rack, to be used for fluid physics research, could lead to improved designs for fuel tanks, water systems and other fluid-based systems by helping researchers understand how fluids react in microgravity.

The mission, designated STS-128, also delivered a new station crew member, a new sleeping compartment, an air purification system and a treadmill named after comedian Stephen Colbert. The mission included three spacewalks to replace experiments outside the European Space Agency's Columbus laboratory and an empty ammonia storage tank. Ammonia is needed to move excess heat from inside the station to the radiators outside.

STS-128 Commander Rick Sturckow was joined on the mission by Pilot Kevin Ford, Mission Specialists Pat Forrester, Jose Hernandez, and Danny Olivas and European Space Agency astronaut Christer Fuglesang. NASA astronaut Nicole Stott

flew to the orbiting complex aboard Discovery to begin a nearly three-month mission as a station resident, replacing Tim Kopra, who returned home on Discovery.

Discovery is expected to begin its return to Kennedy on Sept. 19. The space shuttle will travel approximately 2,500 miles from California to Florida on the back of a modified 747 jumbo jet known as the Shuttle Aircraft Carrier. At Kennedy, Discovery will be separated from the aircraft and processing will

begin for its next flight, targeted for March 2010.

With Discovery and its crew safely home, the stage is set for the launch of space shuttle Atlantis on its STS-129 mission. Atlantis' liftoff is targeted for Nov. 12, though shuttle and station teams are assessing Nov. 9 as a potential launch date. The flight will focus on storing important spare hardware on the space station's exterior. The 11-day flight will include three spacewalks and the installation of two platforms to the station's truss, or backbone.

For more about the STS-128 mission and the upcoming STS-129 flight, visit <http://www.nasa.gov/shuttle>.

Martel, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

**"A beautiful ending
to a great mission."**

— **Steve Cash,**
manager of Marshall's
Shuttle Propulsion Office

THE FACE OF MISSION SUCCESS IS: Angela Jackman

*Systems engineering
& integration lead
in the Ares First Stage Element Office*



- **Organization:** Ares Projects
- **Joined NASA:** 1985
- **Education:** Bachelor's degree in industrial and systems engineering, Auburn University, 1985
- **Responsibilities:** I lead a team that oversees the systems engineering and integration activities of the Ares I first stage, and am responsible for providing our products to the integrated Ares vehicle. Though our products are process-based, our goal is to help get the design right.
- **What is your favorite memory at Marshall?** I have a very vivid memory of seeing a stacked external tank for the first time. I was in awe, considering the enormous quantity of propellant in such a thin structure.
- **How do you like to spend your time out of the office?** Triathlons and travel are my big interests. I love the challenge of seeing if I can do something – trekking up mountains, rafting rivers and racing for hours. I'd love to still be doing this in my 70s – much slower of course.

Four students with Marshall ties awarded Loretta Spencer Scholarships

The Air, Space and Missile Defense Association, or ASMDA, has presented the 2009 Loretta Spencer Scholarships – valued at \$4,000 each – to four students with ties to the Marshall Space Flight Center.

Receiving the awards were Timothy Duquette, a Marshall Center cooperative education student; Amy Frees, daughter of Marshall Deputy Chief Counsel Jim Frees of the Office of the Chief Counsel; and Cheryl Perich and Eric Zirnstein, both Marshall interns.

The awards were presented by former Huntsville Mayor Loretta Spencer during the 12th annual Space and Missile Defense Conference at the Von Braun Center in Huntsville last month.

The scholarships are awarded to undergraduate or postgraduate students studying engineering or science related to air, space and missile defense. The scholarship was named for Spencer in recognition of her lifelong effort to encourage young people to study these fields. She began endowment of the scholarship program seven years ago. Since then, the ASMDA has established a trust fund, increasing the number and amount of the awards.

Duquette is a senior aeronautical/astronautical engineering student at Purdue University in Indiana. He completed his sixth co-op term at Marshall this summer.

Frees is a senior chemical engineering student at the University of Alabama in Tuscaloosa. She has worked as an engineering aide in the Weapons Sciences Directorate in the Aviation and Missile Research, Development & Engineering Center on Redstone Arsenal.

Perich is a senior mechanical engineering student at Marquette University in Wisconsin. She spent this summer as an intern at Marshall, helping to develop wastewater recovery systems for long-term space travel.

Zirnstein is a senior physics student at the University of Alabama in Huntsville, and just completed his fourth summer internship at Marshall. His work focused on the effects of device geometry on the efficiencies of pulsed inductive plasma accelerators.

The Spencer scholarship is available to employees of the Marshall Center; U.S. Army Space and Missile Defense Command; Missile Defense Agency in Huntsville; Missile and Space Intelligence Center; Program Executive Office, Missiles and Space; Targets Joint Project Office; THAAD Project Management Office; and all other Huntsville-based missile defense agencies. Immediate family members of the organizations also are eligible, along with members of the ASMDA and corporate members.

For more information about the Loretta Spencer Scholarship and for eligibility requirements, visit <http://www.asmda.us/spencer.html>.

Obituaries

Thomas J. McCullough Sr., 89, of Huntsville died Aug. 1. He retired from the Marshall Center in 1979 as a program analyst.

Edsel Faught, 85, of Chelsea died Aug. 3. He retired from the Marshall Center in 1980 as an electrical technician. He is survived by his wife, Naomi Faught.

Marshall Health and Safety Expo to feature vendor fair, fun walk, 5k run

The Marshall Space Flight Center will host its ninth annual Health and Safety Expo on Sept. 23 – featuring a variety of activities including a vendor fair, one-mile walk and five-kilometer run.

The event – open to all Marshall civil service and contractor employees – will kick off at 9 a.m. in Morris Auditorium in Building 4200. Dr. Philip Hagen, medical director of the EmbodyHealth Program at the Mayo Clinic in Rochester, Minn., will speak. The program offers tools and health advice from experts at the Mayo Clinic.

A five-kilometer run, called “Run for the Health of It,” will begin at 9 a.m. at the Marshall Wellness Center, Building 4315. There is a \$15 entry fee, payable to the MARS Running

Club. A registration form is available on Inside Marshall, or participants can register the day of the race. For more information, call Sam Ortega at 544-9294 or Ryan Decker at 544-3068.

A “Health, Safety & Fitness” vendor fair will be held from 10 a.m. to 2 p.m. in Activities Building 4316. Booths and displays by some 70 vendors will focus on medical, safety and fitness products and services. A drawing will be held for door prizes, and vendors will provide safety and health information and giveaways for attendees.

A one-mile “Walk for the Health of It” fun walk will start at 11 a.m. outside the Wellness Center. “Bronze Shoe” trophies will be awarded to two Marshall Center offices or directorates – for the most employee participants and for the highest percentage of participants in the walk. The goal for this year’s walk is 600 participants. For more information, call David Thaxton at 544-8371 or David Guy at 544-8092.

Buses will be available to shuttle participants and exhibit attendees back and forth to the event site. For a complete listing of pickup times and locations, visit Inside Marshall.

Classified Ads

To submit a classified ad to the Marshall Star, go to Inside Marshall, to “Employee Resources,” and click on “Employee Ads — Submit Ad.” Ads are limited to 15 words, including contact numbers. No sales pitches. Deadline for the next issue, Sept. 24, is 4:30 p.m. Thursday, Sept. 17.

Miscellaneous

Two sage green Alfred Angelo dresses, size 6 and size 8. 217-0811

Solid wood corner cabinet, \$100; TV stand, \$30; corner shelf, \$10. 881-3612

Delta small truck tool box, heavy-duty locks, \$175. 830-6584

2001 Frigidaire Professional Series stainless side-by-side refrigerator, model FRS26ZSH, \$350. 417-1081

Twin day bed, trundle, mattresses, comforter, three pillow shams, two sheet sets, two blankets, \$300. 232-8307

Yamaha YAS-23 alto saxophone, Pro-Tec case, NeoTech neckstrap, mouthpiece with Rovner ligature, \$450. 714-3768

Hotpoint white electric ceramic range/oven, \$175; Magic

Chef white over-the-range microwave, \$99. 783-3430

Bunk bed, twin upper, futon double lower, dark oak finish, mattresses, \$650. 881-0551

Military parachute canopy, approximately 36 feet across, boat/tractor/camping uses, \$50. 325-6000

Corner computer desk, contemporary style, \$50; seven-drawer desk, wood, 42" by 22 1/2", \$50. 655-8370

Two twin-size Serta mattresses, box springs and bed frames, \$150. 851-0893

Antique oak wash stand, dresser, hall tree. 353-6750

Tailgater Thermos Grill2Go Fire'N'Ice roll-around combination propane grill/cooler, \$100. 233-0705

Two tickets to The Color Purple featuring Fantasia, Sept. 19, Atlanta, seats in front. 508-5503

Vehicles

2006 Chrysler Pacifica Touring, third row, red, 25k miles, \$13,000. 797-1300

2005 Chevrolet Tahoe LT, silver, tan leather, DVD, 91k miles, \$14,750. 565-9918

2002 Coleman Cottonwood popup, stove, fridge, awning, electric brakes, new tires, sleeps eight, \$3,500. 777-4439

2001 Yamaha R1, championship edition, Micron exhaust,

chrome wheels, 4,500 miles, \$6,000 obo. 476-7349

1999 Toyota Sienna LE, V6, white, 150k miles, \$4,390 obo. 797-8393

1998 Stingray boat, RS180, 140hp, Bimini top, many new parts, ski equipment, \$10,000 obo. 640-6427

1997 F150, power steering/brakes/windows, am/fm cassette, CD player, 155k miles, \$4,000. 586-3061

1997 Honda Recon TRX 4-wheeler, \$1,200. 655-6348

1997 Ford F150 XLT, camper shell, maroon, new brakes/battery, fresh tires, \$4,000. 783-2032

1997 VW Jetta GLX, 119k miles, VR6 engine, five speed, \$3,000. 883-7021

1993 F350 crew cab, \$2,500. 723-8877

1978 28-foot Holiday Rambler, \$1,200 obo. 859-2975 or 651-6454

Sea Ray 24-foot deck boat, 2008 galvanized trailer, low hours, \$14,990. 714-9711

Wanted

Horse headstall with snaffle bit. 694-9184

Found

Pair of brown Mossimo sunglasses, Building 4202, third floor, Sept. 8. 544-4680

Marshall's Jeff Ding, Sammy Nabors awarded for introducing friction stir welding tool to commercial marketplace

By Megan Norris Davidson

Two team members in the Marshall Space Flight Center's Engineering Directorate have been recognized for introducing an automatic, retractable tool – called the Auto-Adjustable Pin Tool – to the commercial marketplace.

The tool's coinventor, Jeff Ding, a materials engineer in Marshall's Materials & Processes Laboratory, and Sammy Nabors, the commercialization team lead in Marshall's Technology Transfer/Innovative Partnerships Program Office, were presented "Excellence in Technology Transfer" awards by the Federal Laboratory Consortium for Technology Transfer. Nabors is in charge of licensing inventions by Marshall Center civil servants. He works to promote Marshall-developed technologies – such as the pin tool – to public and private sectors.

NASA owns more than 1,000 patents and patent applications that protect inventions in hundreds of subject-matter categories. All NASA licenses are individually negotiated with the prospective licensee, and each license contains terms concerning transfer, license duration, royalties and periodic reporting.

The Auto-Adjustable Pin Tool is designed to improve friction stir welding – a solid-state joining process in which the original metal components' characteristics must remain as unchanged as possible.

The tool is one of several enhancements the Marshall Center has made to the friction stir welding process. "Welding is a big part of manufacturing in space," Ding said. "With long-duration space travel, like going to Mars, you can't take vehicles full of spare parts, so you have to be able to make new hardware and components in real time during spaceflight. Welding is a big part of that. If an engine breaks down, for example, there must be the capability to repair it or make a new part."

The pin tool improves the welding process by eliminating the "keyhole," a pinhole left when a conventional welding tool is withdrawn from a part. "One of the benefits of this device is it provides the mechanical means to weld material that tapers from one thickness to another, such as the space shuttle external tank where the boosters and orbiter attach," Ding said. "We have been using an auto-adjustable pin tool technology in external tank manufacturing since 2003, and the first external tank with friction stir welds is the STS-128 mission." STS-128 launched Aug. 28 from Kennedy Space Center, Fla.

The tool also helps the friction stir welding pin tool operate more efficiently. The self-reacting friction stir weld is comprised of two shoulders – one rotates on the front side of the weld joint material and the other on the back side. They rotate together at the same number of revolutions per minute, inducing frictional energy into the part from the front and back surfaces.

Previous friction stir welding pin tools had only one rotating shoulder, creating frictional energy only on the front side of the weld material, Ding said. That method required a robust, expensive



Marshall Center materials engineer Jeff Ding, left, and Sammy Nabors, the commercialization team lead for Marshall's Technology Transfer/Innovative Partnerships Program, examine the Auto-Adjustable Pin Tool. The device was coinvented by Ding for the improvement of the friction stir welding process.

anvil to "push" against while passing through the weld.

The new technique does not require the anvil, because there are no pushing forces. Instead, the two shoulders – with the weld joint material between them – squeeze together, creating a "pinch" force equal to the pushing force of the conventional pin tool. The Auto-Adjustable Pin Tool provides the mechanical means to retract one of the shoulders against the other, creating the pinch force.

Self-reacting friction stir welding is the base-line weld process for Ares I upper stage hardware manufacturing. The Ares I rocket will launch explorers to the moon, Mars and beyond in coming decades.

"This tool saves money by reducing the requirement of additional structural hardware, and ultimately provides a better weld," Nabors said.

Ding and Nabors were presented their awards at the Federal Laboratory Consortium for Technology Transfer national meeting in May in Charlotte, N.C. Established in 1974 to strengthen technology transfer nationwide, the consortium is a network of federal laboratories that develops strategies for linking laboratory mission technologies with expertise from the U.S. commercial marketplace.

NASA encourages partnerships with industry, academia and other non-traditional sources to develop and transfer technology in support of national priorities and NASA's mission directorates. These partnerships engage innovators and enterprises throughout the U.S. economy and NASA to fulfill the agency's mission needs and promote the potential of its technology.

Davidson, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

Motor test *Continued from page 1*

This data will provide valuable information as NASA develops the Ares I, the first launch vehicle being designed for NASA's Constellation Program, to carry explorers to the International Space Station, the moon and beyond in coming decades.

The next demonstration motor test, DM-2, is planned for summer 2010.

"With this test, we have taken lessons learned from many years of experience in solid rocket motor development and have built on that foundation,"

said Alex Priskos, first stage manager for Ares Projects at the Marshall Center. "Our team collected data from 650 sensors during the test to evaluate the motor's performance. This test and those that follow are essential to understanding as many aspects of our motor as possible, including strengths and weaknesses, and ultimately delivering the safest and most reliable motor possible."

The Sept. 10 firing was the second attempt to conduct the two-minute rocket test at ATK's test stand in Promontory, Utah. The first was canceled in August because of a problem with a component of the ground controller unit, which sends power to the system that moves the nozzle during the test. During a detailed investigation, the engineering team pinpointed the problem and replaced the faulty part.

"The first stage team was assigned the task of developing a new generation solid rocket motor – designed to be safe,

reliable and robust for NASA's next space transportation system," said Andy Schorr, first stage, five segment motor lead for Ares Projects at the Marshall Center. "This successful motor firing represents real hardware and real progress made possible by the hard work of a dedicated team of engineers both at Marshall and ATK. This was special!"

The first stage motor will generate up to 3.6 million pounds of thrust at launch. Although similar to the solid rocket boosters

that help power the space shuttle to orbit, the Ares development motor includes several upgrades and technology improvements implemented by NASA and ATK engineers.

Motor upgrades include the addition of a fifth segment, a larger nozzle throat, and upgraded insulation and liner.

The DM-1 nozzle throat is 3 inches

wider in diameter than the nozzle used for the shuttle. The bigger nozzle throat allows the motor to handle the additional thrust from the five-segment booster.

The motor cases – the large, barrel-shaped cylinders that house the fuel – are flight-proven hardware used on shuttle launches for more than three decades. The cases used in this ground test collectively have flown on 48 previous missions, including STS-1, the first shuttle flight, in 1981.

Dunn, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.



During the test firing, the 154-foot solid rocket motor produced heat two-thirds the temperature of the sun and its 12-foot-diameter cylinder delivered 3.6 million pounds of thrust.

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